

# Measurements at PITZ in November 2016

## $\delta E$ - measurements program

1. Ecath=60MV/m (?additionally 45MV/m as an option)
2. Gun phase: MMMG
3. Laser temporal profile: short Gaussian of ~2 ps FWHM
4. Bunch charge: 0.2 nC and 0.1 nC
5. BSA=BSA0 (interpolated optimum for each bunch charge – based on the 2015 results) and 2\*BSA0 (? relaxed transverse space charge by a factor of 4). Please check the rms spot size at VC2: XYrms~BSA/4:

Meas \ charge →	0.2 nC	0.1 nC
Laser temporal	<b>Short Gauss</b>	
A	<b>0.85 mm</b>	<b>0.75 mm</b>
B	<b>1.7 mm</b>	<b>1.5 mm</b>

e.g., for measurement “0.1-A” → BSA=0.75mm, for “0.2-B” – BSA=1.7 mm

6. CDS booster: 3MW, phase scan for LPS tomography. The CDS phase for TDS measurements: min projected energy spread at HEDA2(?)
7. Expected measurements (for each of 6 setups: 0.2-A ... 0.1-B – to be saved in e.g. ...\\measure\LongPhSp\2016\deltaE\shortG\0.2-A\...):
  - a. Laser transverse distribution at VC2 (20+20frames)
  - b. Beam momentum scan in LEDA as a function of gun SP Phase → MMMG gun phase, <Pz>, PZrms
  - c. Laser attenuator scan (LT-scan) for the MMMG phase with LOW.FC1 (if it is too noisy – use LOW.FC2, also LOW.ICT1/HIGH1.ICT1), adjust the LT for the goal charge, measure the bunch charge
  - d. Beam momentum in HEDA1 as a function of the booster SP phase (very detailed – to be used for LPS reconstruction). Don’t forget to adjust the e-beam at the reference screen HIGH1.Scr5 (centered and vertically focused). Booster phase MMMG (or min energy spread at HEDA1?).
  - e. Setup the e-beam trajectory; e.g. from 31.10.2016 05:18 (PITZ logbook)
  - f. E-beam size at HIGH1.Scr1 vs. main solenoid current (use fastscan3)
  - g. Beam projected emittance measurements at EMSY1: main solenoid current: focus at HIGH1.Scr1 and +1% of this value (? , rounding the Imain) over the focus.
  - h. Beam transport to the PST.Scr1, TDS measurements of the bunch temporal profile (Imain to be tuned as well? Or use one delivering the best emittance).
  - i. Beam transport to HEDA2 (Imain to be tuned as well?), quad settings for the best HEDA resolution – save magnet settings and beam images at screens in the HIGH section. Check the TDS phase range at HIGH2.Scr1 – not to be cut by the beam line aperture.
  - j. Beam momentum in HEDA2 as a function of the booster SP phase → booster phase for the minimum projected momentum spread.
  - k. LPS measurements at HEDA2 with applied TDS:
    - i. TDS phase scan (calibration)
    - ii. TDS at zero phase – momentum measurements with OMA
    - iii. TDS off – momentum measurements with OMA

1. Ecath=60MV/m (?additionally 45MV/m as an option)
2. Gun phase: MMMG
3. Laser temporal profile: long Gaussian of ~11ps FWHM
4. Bunch charge: 0.4 nC
5. BSA=BSA0 (interpolated optimum for each bunch charge – based on the 2015 results) and 2\*BSA0 (? relaxed transverse space charge by a factor of 4). Please check the rms spot size at VC2: XYrms~BSA/4:

Meas \ charge →	0.4 nC
Laser temporal	<b>Long Gauss</b>
A	<b>1.1 mm</b>
B	<b>2.2 mm</b>

e.g., for measurement “0.4-A” → BSA=1.1mm

6. CDS booster: 3MW, phase scan for LPS tomography. The CDS phase for TDS measurements: min projected energy spread at HEDA2(?)
7. Expected measurements (for each of 6 setups: 0.4-A and 0.4-B – to be saved in e.g. ...\\measure\LongPhSp\2016\deltaE\longG\0.4-A\...):
  - a. Laser transverse distribution at VC2 (20+20frames)
  - b. Beam momentum scan in LEDA as a function of gun SP Phase → MMMG gun phase, <Pz>, PZrms
  - c. Laser attenuator scan (LT-scan) for the MMMG phase with LOW.FC1 (if it is too noisy – use LOW.FC2, also LOW.ICT1/HIGH1.ICT1), adjust the LT for the goal charge, measure the bunch charge
  - d. Beam momentum in HEDA1 as a function of the booster SP phase (very detailed – to be used for LPS reconstruction). Don’t forget to adjust the e-beam at the reference screen HIGH1.Scr5 (centered and vertically focused). Booster phase MMMG (or min energy spread at HEDA1?).
  - e. Setup the e-beam trajectory; e.g. from 31.10.2016 05:18 (PITZ logbook)
  - f. E-beam projected emittance at EMSY1 vs. main solenoid current (use fastscan3), Imain\* for minimum XY-emittance.
  - g. Beam transport to the PST.Scr1, TDS measurements of the bunch temporal profile (Imain to be tuned as well? Or use one delivering the best emittance).
  - h. Beam transport to HEDA2 (Imain to be tuned as well?), quad settings for the best HEDA resolution – save magnet settings and beam images at screens in the HIGH section. Check the TDS phase range at HIGH2.Scr1 – not to be cut by the beam line aperture.
  - i. Beam momentum in HEDA2 as a function of the booster SP phase → booster phase for the minimum projected momentum spread.
  - j. LPS measurements at HEDA2 with applied TDS:
    - i. TDS phase scan (calibration)
    - ii. TDS at zero phase – momentum measurements with OMA
    - iii. TDS off – momentum measurements with OMA